

What is claimed is:

1 1. An apparatus for manufacturing a semiconductor device using
2 plasma, comprising:

3 a chamber having a plasma generating region and a plasma
4 processing region for performing a manufacturing process on the
5 semiconductor device under a plasma atmosphere;

6 a plasma generating means adjacent the plasma generating region;
7 and

8 a plasma concentrating means for reducing the size of the plasma
9 processing region near the semiconductor device to be processed compared
10 to the size of a plasma generating region.

1 2. The apparatus as claimed in claim 1, wherein the plasma
2 concentrating means comprises:

3 an electrode having a first length on which the semiconductor device
4 to be processed is positioned;

5 an insulating plate having a second length longer than the first length
6 and facing the electrode; and

7 a confinement layer contacting the edge of the insulating plate,
8 forming an acute angle to a virtual plane connecting opposing ends of the
9 insulating plate, and extending toward an edge of the first electrode.

1 3. The apparatus as claimed in claim 2, wherein the insulating
2 plate includes a first part having a first radius of curvature and a second part
3 having a second radius of curvature, which is smaller than the first radius of
4 curvature, wherein an edge of the second part of the insulating plate is
5 connected to the confinement layer.

1 4. The apparatus as claimed in claim 2, wherein the insulating
2 plate has a dome shape having a predetermined radius of curvature, and the
3 second length is the same as the projected diameter of the insulating plate.

1 5. The apparatus as claimed in claim 2, wherein the insulating
2 plate is a circular plate having a predetermined diameter, and the second
3 length is the diameter of the insulating plate.

1 6. The apparatus as claimed in claim 1, wherein the plasma
2 concentrating means comprises:
3 an electrode having a first length;
4 an insulating plate having a dome shape, positioned to face the
5 electrode and including a first part having a first radius of curvature and a
6 second part having a second radius of curvature which is smaller than the
7 first radius of curvature; and

8 a confinement layer connected to the second part of the insulating
9 plate and extending toward the electrode,
10 wherein a second length, which is a projected length of the insulating
11 plate, is larger than the first length of the electrode.

1 7. The apparatus as claimed in claim 6, wherein the confinement
2 layer is substantially perpendicular to the projected length of the insulating
3 plate.

1 8. The apparatus as claimed in claim 2, further comprising a
2 chuck for supporting a wafer having a third length and disposed on the
3 electrode.

1 9. The apparatus as claimed in claim 8, wherein the second
2 length is over 140% of the third length.

1 10. The apparatus as claimed in claim 9, wherein the first length of
2 the electrode is over 120% of the third length.

1 11. The apparatus as claimed in claim 10, wherein the distance
2 from the edge of the wafer to an associated edge of the electrode is between
3 10 and 15% of the third length.

1 12. The apparatus as claimed in claim 10, wherein the second
2 length is approximately 420mm and the third length is approximately
3 300mm.

1 13. The apparatus as claimed in claim 12, wherein the electrode
2 has a diameter of approximately 360mm.

1 14. The apparatus as claimed in claim 2, wherein the acute angle
2 is between 45 and 89 degrees.

1 15. The apparatus as claimed in claim 2, wherein the confinement
2 layer is formed of a sidewall of the chamber.

1 16. The apparatus as claimed in claim 1, wherein the plasma
2 generating means is installed outside of the chamber to generate plasma
3 that is introduced into the plasma generating region of the chamber.

1 17. The apparatus as claimed in claim 16, wherein the plasma
2 generating means comprises a plurality of induction coils mounted on the
3 chamber and a first power supply connected to the plurality of induction coils.

1 18. The apparatus as claimed in claim 17, wherein the plasma
2 generating means comprises a second power supply connected to an
3 electrode on which the semiconductor device is positioned.

1 19. An apparatus for increasing plasma density at an edge of a
2 semiconductor device during a plasma-etch manufacturing process,
3 comprising:

4 a first chamber within which a plasma is generated, and
5 a second chamber within which the semiconductor device is
6 positioned for plasma-etch manufacturing process,
7 the second chamber having a smaller cross-sectional area than the
8 first chamber.

1 20. The apparatus as claimed in claim 19, further comprising a
2 plurality of induction coils for generating the plasma in the first chamber, and
3 an electrode for attracting the plasma into the second chamber.